CERTIFICATE OF TRANSLATION

As a below named translator, I hereby declare that my residence and citizenship are as stated below next to my name and I hereby certify that I am conversant with both the English and Korean languages and the document enclosed herewith is a true English translation of the Priority Document with respect to the Korean patent application No. **1999-42136** filed on **September 30, 1999.**

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CITIZENSHIP : REPUBLIC OF KOREA

Translation of Priority Document

THE KOREAN INTELLECTUAL PROPERTY OFFICE

This is to certify that annexed hereto is a true copy from the records of the Korean Intellectual property Office of the following application as filed

Application Number : Korean Patent Application No. 1999-42136

Date of Application : September 30, 1999

Applicant(s) : Samsung Electronics Co., Ltd.

July 26, 2000

COMMISSIONER

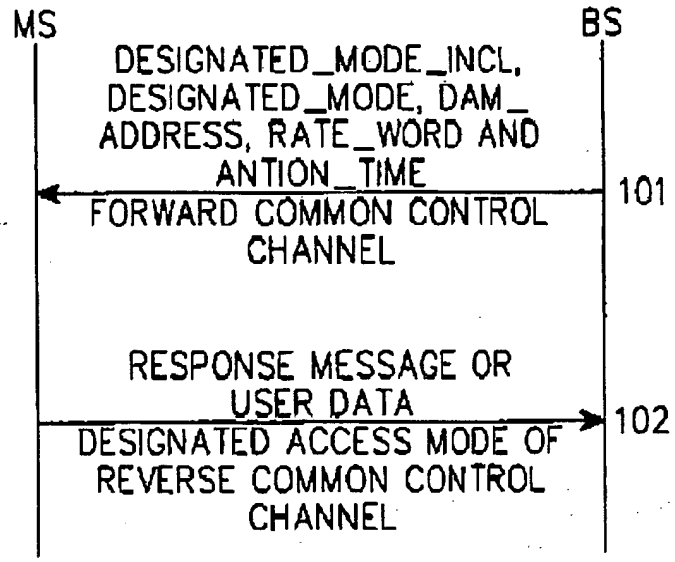
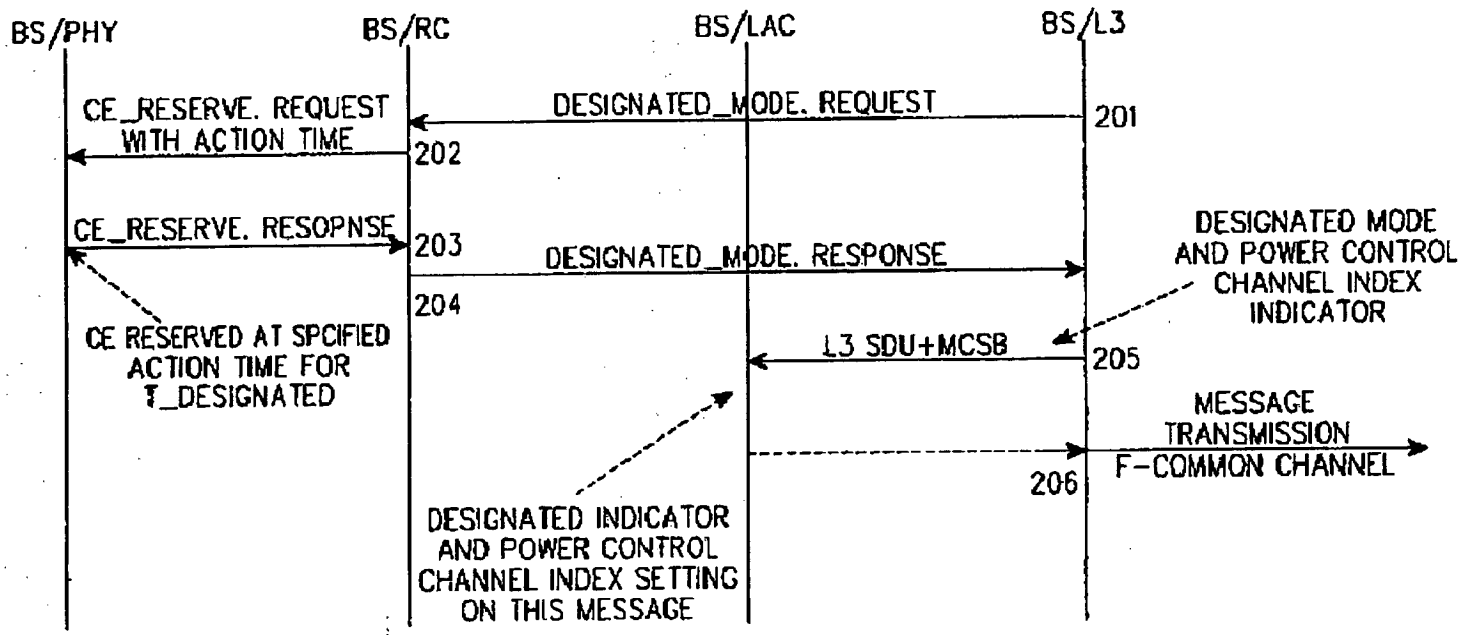

MS
BS
DESIGNATED_MODE_INCL, DESIGNATED_MODE, DAM_ ADDRESS, RATE_WORD AND ANTION_TIME
FORWARD COMMON CONTROL CHANNEL
101
RESPONSE MESSAGE OR USER DATA
DESIGNATED ACCESS MODE OF REVERSE COMMON CONTROL CHANNEL
102

FIG.1


BS/PHY
BS/RC
BS/LAC
BS/L3
CE_RESERVE. REQUEST WITH ACTION TIME
DESIGNATED_MODE. REQUEST
201
202
CE_RESERVE. RESOPNSE
203
DESIGNATED_MODE. RESPONSE
DESIGNATED MODE AND POWER CONTROL CHANNEL INDEX INDICATOR
204
CE RESERVED AT SPCIFIED ACTION TIME FOR T_DESIGNATED
L3 SDU+MCSB
205
MESSAGE TRANSMISSION F-COMMON CHANNEL
206
DESIGNATED INDICATOR AND POWER CONTROL CHANNEL INDEX SETTING ON THIS MESSAGE

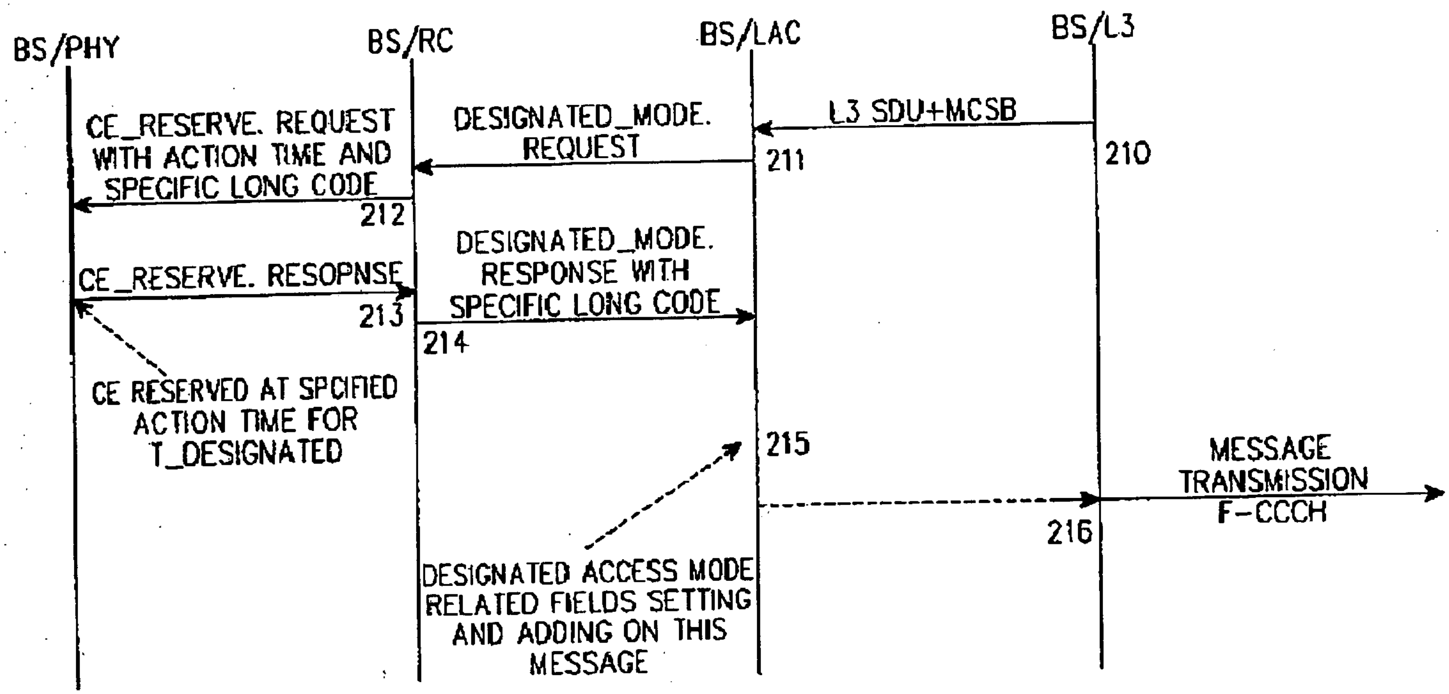

BS/PHY
BS/RC
BS/LAC
BS/L3
L3 SDU+MCSB
210
DESIGNATED_MODE. REQUEST
211
CE_RESERVE. REQUEST WITH ACTION TIME AND SPECIFIC LONG CODE
212
CE_RESERVE. RESOPNSE
213
DESIGNATED_MODE. RESPONSE WITH SPECIFIC LONG CODE
214
CE RESERVED AT SPCIFIED ACTION TIME FOR T_DESIGNATED
215
DESIGNATED ACCESS MODE RELATED FIELDS SETTING AND ADDING ON THIS MESSAGE
216
MESSAGE TRANSMISSION F-CCCH

FIG. 2B

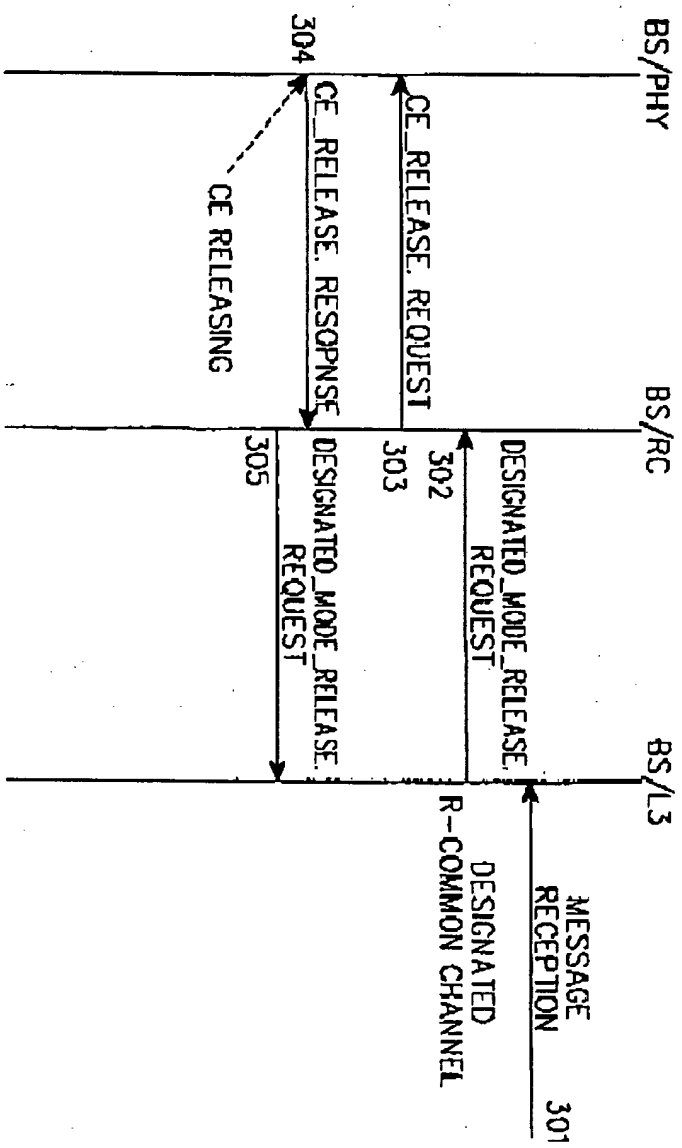
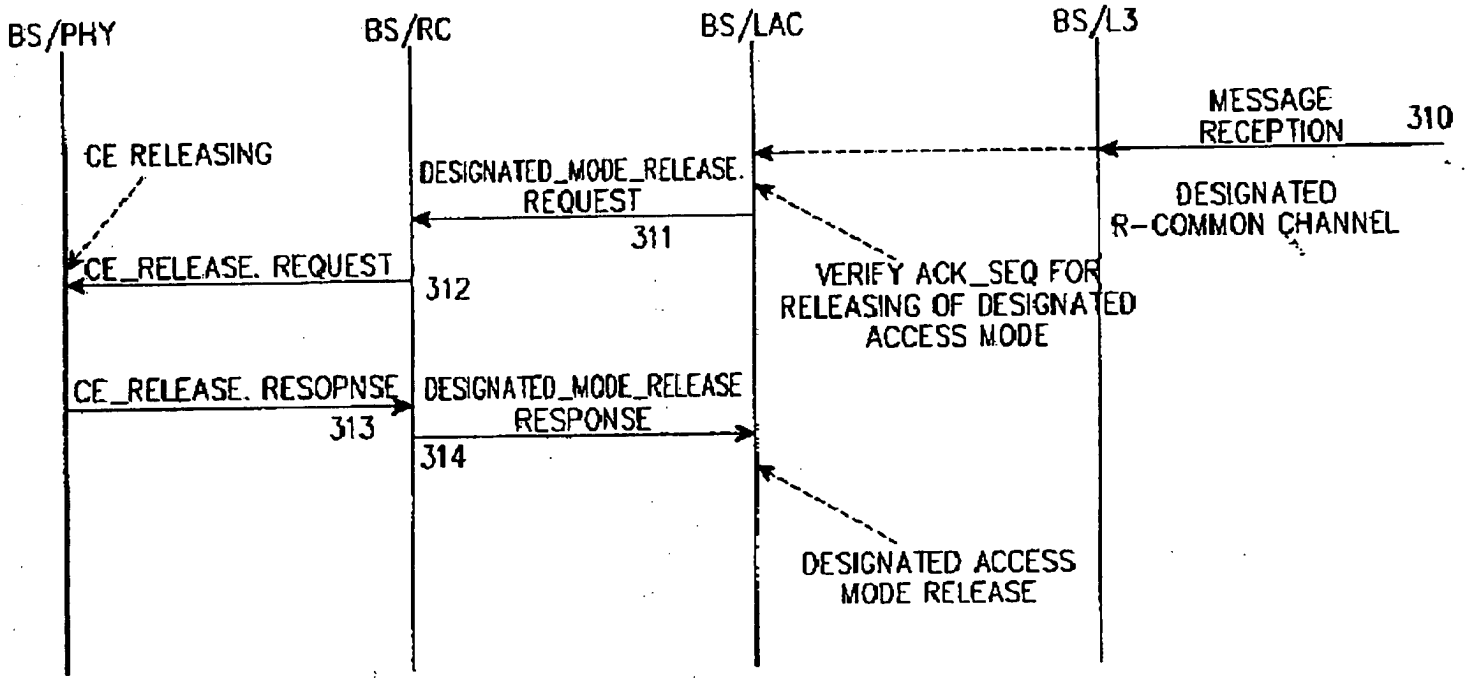

BS/PHY
BS/RC
BS/L3
304
CE_RELEASE. REQUEST
CE RELEASING
CE_RELEASE. RESOPNSE
302
303
DESIGNATED_MODE_RELEASE. REQUEST
305
DESIGNATED_MODE_RELEASE. REQUEST
R-COMMON CHANNEL
DESIGNATED
MESSAGE RECEPTION
301

FIG.3A


BS/PHY
BS/RC
BS/LAC
BS/L3
MESSAGE RECEPTION
310
CE RELEASING
DESIGNATED_MODE_RELEASE. REQUEST
311
DESIGNATED R-COMMON CHANNEL
CE_RELEASE. REQUEST
312
VERIFY ACK_SEQ FOR RELEASING OF DESIGNATED ACCESS MODE
CE_RELEASE. RESOPNSE
313
DESIGNATED_MODE_RELEASE RESPONSE
314
DESIGNATED ACCESS MODE RELEASE

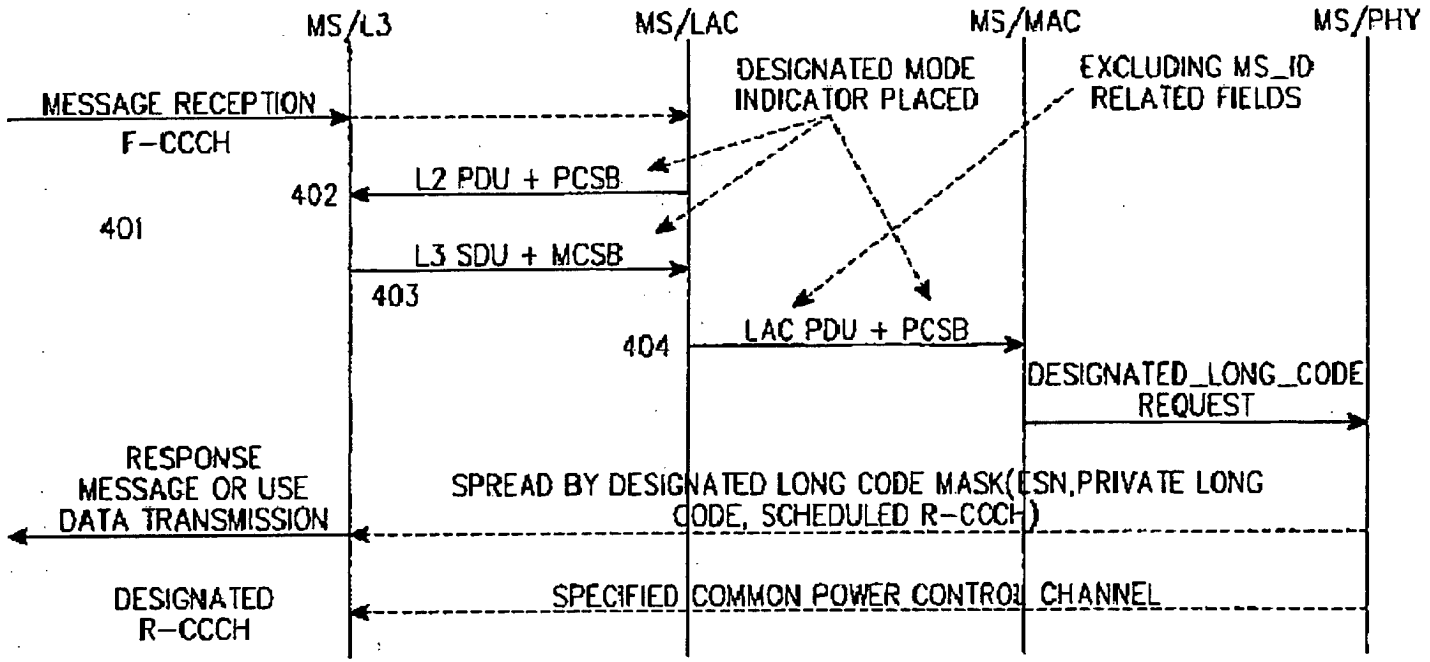

MS/L3
MS/LAC
MS/MAC
MS/PHY
DESIGNATED MODE INDICATOR PLACED
EXCLUDING MS_ID RELATED FIELDS
MESSAGE RECEPTION
F-CCCH
401
L2 PDU + PCSB
402
L3 SDU + MCSB
403
LAC PDU + PCSB
404
DESIGNATED_LONG_CODE REQUEST
RESPONSE MESSAGE OR USE DATA TRANSMISSION
SPREAD BY DESIGNATED LONG CODE MASK(ESN,PRIVATE LONG CODE, SCHEDULED R-CCCH)
DESIGNATED R-CCCH
SPECIFIED COMMON POWER CONTROL CHANNEL

FIG 4

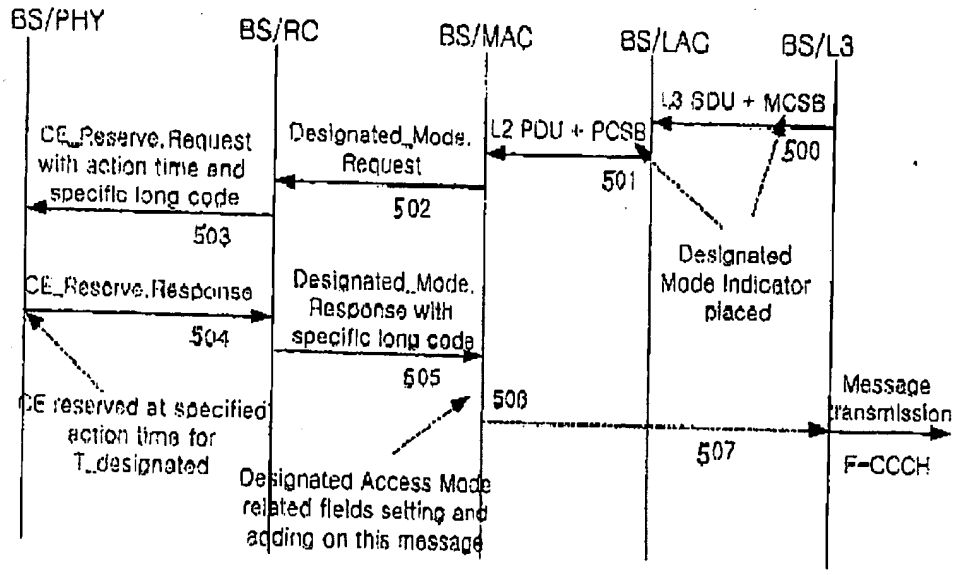

BS/PHY
BS/RC
BS/MAC
BS/LAC
BS/L3
L3 SDU + MCSB
500
CE_Reserve.Request with action time and specific long code
503
Designated_Mode. Request
502
L2 PDU + PCSB
501
Designated Mode Indicator placed
CE_Reserve.Response
504
Designated_Mode. Response with specific long code
505
CE reserved at specified action time for T_designated
Designated Access Mode related fields setting and adding on this message
506
507
Message transmission
F-CCCH

FIG.5

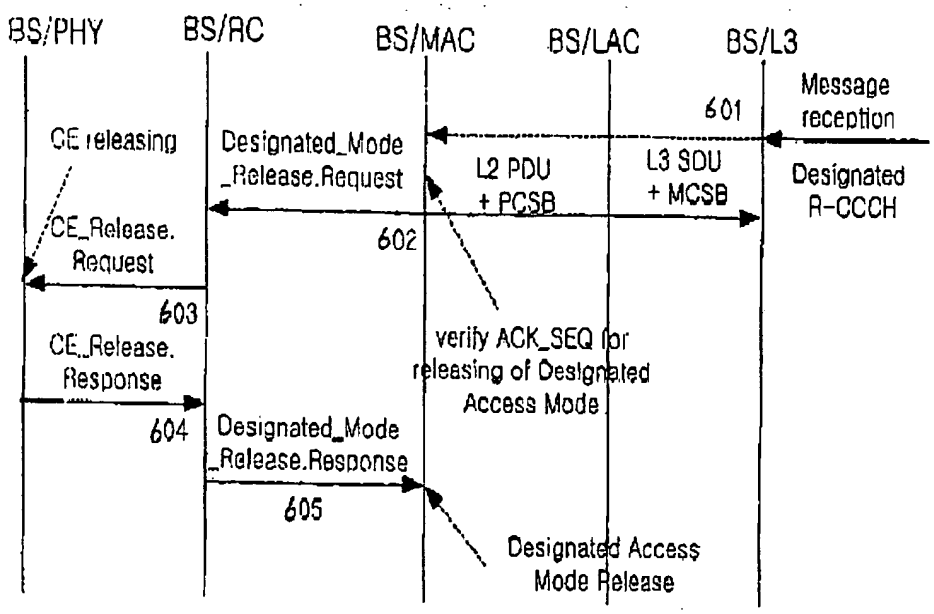

BS/PHY
BS/RC
BS/MAC
BS/LAC
BS/L3
Message reception
601
CE releasing
Designated_Mode _Release.Request
L2 PDU + PCSB
L3 SDU + MCSB
Designated R-CCCH
CE_Release. Request
602
603
CE_Release. Response
verify ACK_SEQ for releasing of Designated Access Mode
604
Designated_Mode _Release.Response
605
Designated Access Mode Release

FIG.6

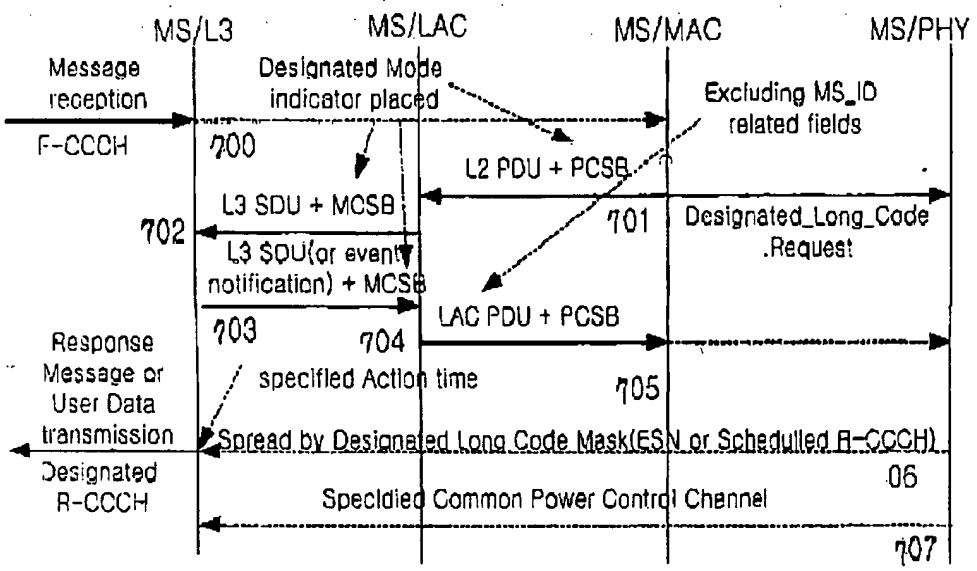

MS/L3
MS/LAC
MS/MAC
MS/PHY
Message reception
F-CCCH
Designated Mode indicator placed
Excluding MS_ID related fields
700
L2 PDU + PCSB
L3 SDU + MCSB
702
701
Designated_Long_Code .Request
L3 SDU(or event notification) + MCSB
LAC PDU + PCSB
703
704
Response Message or User Data transmission
specified Action time
705
Spread by Designated Long Code Mask(ESN or Scheduled R-CCCH)
Designated R-CCCH
06
Specidied Common Power Control Channel
707

FIG.7

[SPECIFICATION]

[TITLE OF THE INVENTION]

METHOD FOR DESIGNATING A REVERSE COMMON CHANNEL FOR DEDICATED COMMUNICATION IN A MOBILE COMMUNICATION SYSTEM

[BRIEF DESCRIPTION OF THE DRAWINGS]

FIG. 1 is a signal flow in a basic procedure of designating a reverse common channel to be dedicated according to the preferred embodiment of the present invention.

FIG. 2A illustrates a BS message transmission procedure for reverse common channel designation in a BS LAC layer in case a BS signaling layer requests release of a channel element (CE) from a reserved state according to another preferred embodiment of the present invention.

FIG. 2B illustrates a BS message transmission procedure for reverse common channel designation in the BS LAC layer in case the BS LAC layer requests release of a channel element (CE) from a reserved state according to the second preferred embodiment of the present invention.

FIG. 3A illustrates a BS message reception procedure for reverse common channel designation in the BS LAC layer in case the signaling layer requests release of the CE from a reserved state according to the second preferred embodiment of the present invention.

FIG. 3B illustrates a BS message reception procedure for reverse common channel designation in the BS LAC layer in case the BS LAC layer requests release of the CE from a reserved state according to the second preferred embodiment of the

present invention.

FIG. 4 illustrates an MS message transmission and reception procedure for reverse common channel designation according to the second preferred embodiment of the present invention.

FIG. 5 illustrates a BS transmission procedure for reverse common channel designation in a BS MAC layer according to a third preferred embodiment of the present invention.

FIG. 6 illustrates a BS reception procedure for reverse common channel designation in the BS MAC layer according to the third preferred embodiment of the present invention.

FIG. 7 illustrates a signal communication procedure on a designated reverse common channel in an MS MAC layer according to the third preferred embodiment of the present invention.

[DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT]

[OBJECT OF THE INVENTION]

[RELATED FIELD AND PRIOR ART OF THE INVENTION]

The present invention relates generally to a common channel communication method in a Code Division Multiple Access (CDMA) communication system, and in particular, to a method for designating a common channel for dedicated communication with a specific mobile station.

Conventional CDMA mobile communication systems, which primarily provide voice service, have evolved into IMT-2000 standard systems. In addition to voice service, IMT-2000 systems can provide high quality voice service, moving

picture service, and Internet browsing.

Data is communicated on dedicated channels and common channels in a mobile communication system. Dedicated channels and common channels are available on both the forward and reverse links. The common channels are so named because each common channel is commonly shared by a plurality of mobile stations (MSs). If more than one of the MSs attempt a call on a common channel at the same time, contention occurs, impeding reliable communications. The contention problem of common channels is more serious on the reverse link than on the forward link.

On the other hand, no channel contention occurs on a dedicated channel because the dedicated channel is literally dedicated to one-to-one communication between a base station (BS) and an individual mobile station. Therefore, the message transmission success rate is high on the dedicated channel. Due to the low transmission success rate on common channels, an MS will attempt to access a BS repeatedly on a common channel. Consequently, resources are misused and inter-channel interference increases.

In present CDMA mobile communication systems, especially the North America system, there are an R-CCCH (Reverse Common Control Channel) and an R-EACH (Reverse Enhanced Access Channel) for the reverse link, whereas, in a conventional IS-95B communication system, there is only an R-ACH (Reverse Access Channel) for the reverse link. When the MS has to transmit data on the R-ACH, it competes with other MSs for the R-ACH and this competition or contention often leads to access failure.

As described above, in the competition-based reverse common channel communication method, when the MS has to transmit data on the R-ACH, it competes with other MSs for the R-ACH and this competition or contention often leads to access failure. Therefore, various methods have been suggested through which a mobile station can promptly access a common channel when a base station communicates with the mobile station through the common channel in a CDMA mobile communication system.

[SUBSTANTIAL MATTER OF THE INVENTION]

It is, therefore, an object of the present invention to provide an apparatus and method for communicating between a BS and an MS on common channels with an increased transmission performance in a CDMA communication system.

It is also an object of the present invention to provide an apparatus and method for designating a common channel to be dedicated for one-to-one communication between a BS and a particular MS in a CDMA communication system.

It is another object of the present invention to provide an apparatus and method for designating a reverse common channel to be dedicated as a one-to-one communication link between a BS and an MS in a CDMA communication system, where the BS transmits a control message including spreading code information required for common channel designation and information about a common power control channel to the MS, and the MS spreads user data with the designated spreading code according to the control message.

It is a further object of the present invention to provide a method for constructing messages in a BS LAC layer and interfacing between BS layers in order to designate a reverse common channel to be dedicated for one-to-one communication between a BS and a particular MS in a CDMA communication system.

It is still another object of the present invention to provide a method for constructing a message in a BS LAC layer and interfacing between BS layers in order to release a reverse common channel from a dedicated mode in a CDMA communication system.

It is yet another object of the present invention to provide a method for constructing a message in a MS LAC layer and interfacing between MS layers in order to designate a reverse common channel to be dedicated for a communication between a BS and an MS and release the reverse common channel from the designated mode in a CDMA communication system.

It is a seventh object of the present invention to provide a method for constructing a message in a BS MAC layer and interfacing between BS layers in order to designate a reverse common channel to be dedicated for a communication between a BS and an MS in a CDMA communication system.

It is an eighth object of the present invention to provide a method for constructing a message in a BS MAC layer and interfacing between BS layers in order to release a reverse common channel from a dedicated mode in a CDMA communication system.

It is a ninth object of the present invention to provide a method for constructing a message in a MS MAC layer and interfacing between MS layers in order to designate a reverse common channel to be dedicated for a communication between a BS and an MS and release the reverse common channel from the dedicated mode in a CDMA communication system.

[CONSTRUCTION AND OPERATION OF THE INVENTION]

A preferred embodiment of the present invention will be described hereinbelow with reference to the accompanying drawings.

In present CDMA mobile communication systems, there is an R-CCCH (Reverse Common Control Channel) and an R-EACH (Reverse Enhanced Access Channel) for the reverse link, whereas, in a conventional IS-95B communication system, there is only an R-ACH (Reverse Access Channel) for the reverse link. When the MS has to transmit data on the R-ACH, it competes with other MSs for the R-ACH and this competition or contention often leads to access failure. To increase the transmission performance of the reverse channel, methods have been suggested in which common channels are designated to be dedicated. Such methods are disclosed in Korean Application Nos. 1998-14179, 1998-13150, 1998-14274, 1998-14275, 1998-14276, and 1998-14880 filed by the present applicant. According to common channel designation methods, when a BS and an MS attempt a call on a common channel, the MS designates a common channel for use in accessing the BS to be dedicated or quasi-dedicated to thereby be immune from the interference of common channel signals from other MSs and thus increase the transmission success rate.

The present invention is intended to provide an apparatus and method for designating a reverse common channel to be dedicated for one-to-one communication between a BS and an MS in a CDMA communication system. A first embodiment of the present invention covers the structure of a message generated from a LAC (Link Access Control) layer of the BS, inter-layer interfacing, the structure of a message generated from the MS in response to a received message, and a communication method between the BS and the MS.

A second embodiment of the present invention covers the structure of a message generated from a MAC (Medium Access Control) layer of the BS, inter-layer interfacing, the structure of a message generated from the MS in response to a received message, and a communication method between the BS and the MS.

Designation of a reverse common channel to be dedicated can be implemented in a signaling layer as well as in the LAC layer and the MAC layer described in the first and second embodiments of the present invention. When message fields are formed not by the LAC layer and the MAC layer but by the signaling layer, the layers may be interfaced in a different manner.

The preferred embodiment of the present invention provides an apparatus and method for designating a reverse common channel to be dedicated and an inter-protocol layer interfacing method. For this purpose, a BS transmits a control message on a forward common channel to an MS. This control message includes long code information representing the spreading code for common channel designation and common power control channel information. The MS responds to the control message with a response message. In this case, the reverse common channel designation

relieves the MS of the constraint of competing with other MSs for access to the common channel. In the embodiment of the present invention, reverse common channels include a reverse access channel (R-ACH), a reverse common control channel (R-CCCH), and a reverse enhanced access channel (R-EACH).

The reverse common channel designation ensures a rapid response time in transmitting a message on a designated reverse common channel, increases the transmission success rate of the reverse common channel, and reduces inter-channel interference caused by message re-transmission. Further, it decreases the number of fields added by an MS LAC layer, thereby reducing errors that occur during message transmission.

Now, the preferred embodiment of the present invention will be described in detail with reference to the attached drawings.

FIG. 1 illustrates the signal flow between the BS and the MS in a common channel designating procedure for the case that the BS requests that the MS designate a common channel to be dedicated and the MS receives a message including parameters necessary for common channel designation from the BS, according to the preferred embodiment of the present invention.

Referring to FIG. 1, the BS transmits dedication information (designated channel indicating parameters) to the MS on a forward common channel in step 101. The dedication information includes a designated channel including indicator (DESIGNATED_MODE_INCL), a designated channel indicator (DESIGNATED_MODE), the address of a common power control channel

(DAM_ADDRESS: Designated Access Mode_ADDRESS), the data rate (Rate_Word), and the action time. Here, the action time may be added to a message or preset in a system. When the action time is added to a message for transmission, the message may be a common channel designating message or an access parameter message. Therefore, when the BS is to designate a common channel to be dedicated for communication with a particular MS, it transmits a message with message fields including the above parameters constructed by a LAC or MAC layer to the MS on a forward common channel. Then, the MS analyses the message. If the MS confirms that the message includes the designated channel indicating parameters, it designates a reverse common channel to be dedicated according to the parameters and transmits a response message to the BS on the designated reverse common channel in step 102. The response message may be a response for the received message or a user data traffic message. Since user traffic data is transmitted after common channel designation, the user data traffic message, if it is longer than a frame length supported by a physical layer, is segmented prior to transmission. For designation of the reverse common channel, the MS may use its unique long code mask like an ESN (Electronic Serial Number) mask, a private long code mask, or a scheduled R-CCCH long code mask assigned to a specific MS by a BS through scheduling. When the schedule R-CCCH mask is used, the MS constructs the mask using the address of a common power control channel that is referred to for designation of a reverse common channel.

A description will be made of a reverse common channel designating method in the LAC or MAC layer of the BS.

Table 1 lists exemplary messages transmitted from the BS to the MS on a forward common channel. Upon receipt of these messages, the MS should transmit

response messages for the messages to the BS on a reverse common channel. In the preferred embodiment of the present invention, the BS includes the designated channel indicating parameters in the messages shown in Table 1 and the MS transmits corresponding response messages to the BS after designating the reverse common channel based on the designated channel indicating parameters, by way of example.

(Table 1)

Message Title on f-csch
Status Request Message
TMSI Assignment Message
General Page Message
SSD Update Message
Authentication Challenge Message
Base Station Challenge Confirmation Order
Extended Release Message
Service Redirection Message
Data Burst Message
Service Release Message
Order Message

Referring to Table 1, if the BS transmits a status request message to the MS on a forward common signaling channel (f-csch), the MS transmits a status response message to the BS on a reverse common signaling channel (r-csch). When the MS transmits the exemplary messages of Table 1 on a reverse common channel in the conventional mobile communication system, the messages may not reach the BS

reliably and thus need to be retransmitted. The retransmission may incur interference with other MSs. However, transmission performance can be increased by designating the reverse common channel to be dedicated and transmitting the messages on the designated reverse common channel according to the preferred embodiment of the present invention.

To designate the reverse common channel, the LAC or MAC layer adds designated channel indicating parameters shown in Table 2 to the forward channel messages of Table 1, according to the preferred embodiment of the present invention.

(Table 2)

L3 SDU in Table 1	L3 SDU length [in bits] in Table 1
DESIGNATED_MODE_INCL	1
DESIGNATED_MODE	0 or 1
DAM_ADDRESS	0 or 6
RATE_WORD	0 or 3

Though not shown in Table 2, the action time is added to the messages shown in Table 1 or preset in the system. If the action time is added to a message, a BS signaling layer or LAC layer adds it. On the other hand, if the system presets the action time, the system estimates time when a message is transmitted from an MS, considering time required for transmission of a message on a common channel to an MS, that is, propagation time delay and message processing time. The action time may be added to a common channel designation request message or an access parameter message. If the action time is added to the access parameter message, the MS receives it when it access the system and stores it. When the MS receives a common channel

designation command, it transmits a message to the BS based on the stored action time.

The designated channel indicating parameter fields include the four parameters (or action time in addition) shown in Table 2. In Table 2, DESIGNATED_MODE is a field that orders the MS to designate a common channel to be dedicated, the field DAM_ADDRESS represents the address of a common power control channel, i.e., the index of the common power control channel that is referred to for control of the transmission power of a message to be transmitted after common channel designation, and the field RATE_WORD indicates the transmission rate of a designated reverse common channel. The LAC layer adds a field Action_Time to notify the MS of the time to transmit a response message after the MS receives an exemplary message as shown in Table 1. The BS adds the two fields when it transmits a particular message or requests the MS to transmit a response message on the designated common channel.

For designation of the common channel to be dedicated, the corresponding MS should use a predetermined long code in spreading the reverse common channel and the BS should reserve a channel element to receive the reverse channel signal spread with the spreading code.

FIGs. 2a to 4 illustrate procedures of designating a reverse common channel in a BS LAC layer and an MS LAC layer according to the first embodiment of the present invention, FIGs. 5 to 7 illustrate procedures of designating a reverse common channel in a BS MAC layer and an MS MAC layer according to the second embodiment of the present invention.

First, a description will be made of the procedures of designating a reverse common channel in a BS LAC layer and an MS LAC layer according to the first embodiment of the present invention

FIG. 2a is the signal flow in a procedure for adding information about the reverse common channel designation in the BS LAC layer, according to the preferred embodiment of the present invention.

Referring to FIG. 2a, an LAC layer (L2) of the BS requests reservation of a channel element before designation of the common channel in step 201, as stated above. The designated mode can be set to designate the reverse common channel even when the BS is to transmit a message that acknowledges designation among response-requiring messages. Here, the f-csch messages listed in Table 1 require response messages from the MS. When a response message should be received on a designated reverse common channel, the BS L2 layer outputs a mode signal (Designated_Mode) requesting reservation of channel resources.

Upon receipt of the channel element reservation request from the BS L2, the resource controller (RC) of the BS transmits a channel element reservation request signal including reservation action time (CE_Reserve. Request with Action Time) to the physical layer (PHY) of the BS. The action time may be added to a message directed to the MS or preset in the system. Action Time is set to an appropriate value considering the time until the BS receives a response message from the MS after the MS receives a forward common channel message from the BS. Action Time is added in a LAC or signaling layer of the BS. The LAC layer adds one bit for USE_TIME and 6 bits for ACTION_TIME to set Action Time. The duration (T_designated) of the

channel element reserved state is also set to prevent continuous occupation of the channel element and misuse of resources in case the BS fails to receive the response message within a predetermined time. The reservation duration can be set in consideration of time required for transmission of the forward common channel message, time required to process the forward common channel message in the MS, and time taken for other related operations.

The reservation duration, set in step 203 of FIG. 2a, is necessary in case that the MS does not recognize the forward common channel message transmitted from the BS and thus cannot transmit a response message to the BS. Thus, the channel element starts to operate at the action time and the channel reserved state lasts for a time period set in a reservation timer (T_designated). Unless the BS fails to receive a required response message until the reservation timer expires, it automatically releases the channel element from the reserved state in order to prevent the dissipation of resources caused by the continuous reservation of the channel element. Thus, the timer should be set to an appropriate value.

In step 203, the PHY notifies the RC of information about channel element reservation. If it is not possible to reserve the channel element, the PHY generates a signal indicating "reservation unavailable" and the timer value is not set. If the channel element has been reserved, the PHY generates a reservation complete signal.

In step 204, the RC transmits a response received from the PHY to the L3.

If the L3 receives a signal indicating "reservation unavailable", it transmits common channel designation request information to the L2 through a message control

status block (MCSB) to receive a response message for a transmission message or user traffic data from the MS. Upon receipt of the MCSB with an L3 SDU from the L3, it recognizes the processing method of the current received message and adds the following fields to a message for designation of a common channel.

The L2 sets DESIGNATED_MODE to 1 and writes the address of a common power control channel for reference in the MS and the data rate of a designated channel in the fields DAM_ADDRESS and RATE_WORD, respectively. If the L2 adds the action time to the message, it sets USE_TIME and ACTION_TIME. The action can be added by the L3.

If there is no common channel designation indication in the MCSB, the L2 sets DESIGNATED_MODE to 0 and omits the fields DAM_ADDRESS and RATE_WORD. Either the L2 or the L3 does not add USE_TIME and ACTION_TIME. This implies that the reverse common channel has the same characteristics as a conventional reverse common channel.

The thus-constituted message is transmitted to the MS on a forward common channel in step 205. Setting DESIGNATED_MODE to 1 in the transmission message implies that the MS should spread the reverse common channel with a particular long code. The long code may be a code unique to the MS.

FIG. 2B illustrates a BS operation similar to that shown in FIG. 2A, except that the L2 reserves the CE. Referring to FIG. 8B, the L3 transmits an MCSB including a command requesting setting of ACK_REQ along with an SDU to the L2 in step 210. If the received MCSB includes the command requesting setting of

ACK_REQ, the L2 transmits Designated_Mode. Request to the RC, commanding reservation of the CE in step 211. In step 212, the RC checks the MAC state of the MS and transmits CE_Reserve. Request to the PHY. If the BS knows the ESN of the MS (e.g., in a suspended state), it designates an ESN-based long code mask. Otherwise, it designates a schedule R-CCCH long code mask. In addition, the BS sets an action time for synchronization to a message transmission time of the MS. The action time can be set using the previous action time value transmitted through a common channel designation request message or an (enhanced) access parameter message. In step 213, the PHY notifies the RC of information about CE reservation. In step 214, the RC transmits information about whether common channel designation is successful or not to the L2. In the case of successful common channel designation, the RC informs the LS of a designated long code mask type. The L2 sets common channel designated-related fields and adds them to a transmission message in step 206 and transmits the message on an F-CCCH I step 207.

FIG. 3A illustrates a BS operation when the BS receives the response message for the transmitted forward common channel message or user data traffic from the MS on the designated reverse common channel according to the second preferred embodiment of the present invention.

Referring to FIG. 3A, the BS receives the response message from the MS on the designated reverse common channel in step 301. If the reverse common channel has not been designated, the BS has, in effect, received the message on a conventional access channel.

In step 302, the L3 notifies the RC that the designated duration of the reverse

common channel expires, when the L3 receives the user traffic data or the response message for the transmitted message that requires a response.

In step 303, the RC notifies the PHY that the reverse common channel should be released from the designated mode. Then, the PHY demodulates the designated reverse common channel spread with a unique MS long code, (e.g., an ESN) and releases the reservation of the channel element.

In step 304, the PHY notifies the RC that the reservation of the channel element has been released. Then, the RC notifies the L3 of the release of the channel element from the reserved state, thereby wholly releasing the reverse common channel from the designated mode, in step 405.

FIG. 3B illustrates a procedure of releasing the reverse common channel from a designated mode in the BS LAC layer, unlike the procedure shown in FIG. 3A. In step 310, a message is received on a designated R-CCCH. The L2 processes ACK_REQ of the received message, determines whether the message is a response for a message requiring DAM, and transmits a DAM release request to the RC if the message is the response message in step 311. The RC requests release of the CE in step 312. The PHY releases the CE from the reserved state and notifies the RC of the result in step 313. The RC notifies the L2 that DAM has been released in step 314.

As described above, for a communication between a BS and a specific MS on a designated reverse common channel, a channel element is reserved and the reservation duration of the channel element is set. If the reserved channel element is available, the BS transmits dedication information (designated channel indicating

parameters) to the MS on a forward common channel at a designated action time. The dedication information is added to one of the forward common channel messages shown in Table 1 that require response messages on a reverse common channel and includes the designated channel indicating parameters of DESIGNATED_MODE_INCL, DESIGNATED_MODE, DAM_ADDRESS, and RATE_WORD as shown in Table 2. DESIGNATED_MODE_INCL may be one bit. If this field is set, a spreading code that designates the reverse common channel is generated. Here, the BS and the MS control a preset dedicated long code to be generated for the reverse common channel. The spreading code can be a long code mask generated using the ESN mask of the MS, a public long code mask, or a predetermined long code for common channel designation.

If the DESIGNATED_MODE_INCL is set to 0, then the DAM_ADDRESS and the RATE_WORD are also removed. If the DESIGNATED_MODE_INCL is set to 1, then the DAM_ADDRESS and the RATE_WORD are properly set. When a long code mask is generated using an ESN, the DAM_ADDRESS represents the address of a power control channel to which an MS refers. When a long code mask is generated using a scheduled R-CCCH, the DAM_ADDRESS is used as one factor for both address of a power control channel and a long code mask.

Table 3 shown below lists message fields added by a LAC layer of the MS when the MS transmits the response message on the designated reverse common channel.

(Table 3)

Field	Basic Mode	Designated Mode	Length [bit]

MSG_TYPE	M	M	8
ACK_SEQ	M	M	3
MSG_SEQ	M	M	3
ACK_REQ	M	M	1
VALID_ACK	M	M	1
ACK_TYPE	M	M	3
MSID_TYPE	M	O	3
MSID_LEN	M	O	4
MSID	M	O	8 × MSID_LEN

(M: Mandatory, O: Optional)

where message fields labeled with M are always included in a message and message fields labeled with O can be omitted when a reverse common channel is designated.

In Table 3, the LAC layer adds the fields listed under Basic Mode when the MS is to transmit the response message on the reverse common channel. Because the common channel is commonly shared by a plurality of MSs, the MS should transmit its address to the BS so that the BS can identify the MS. Therefore, MSID_TYPE, MSID_LEN, and MSID are of necessity added. However, if the reverse common channel is designated to be dedicated to the specific MS, the fields MSID_TYPE, MSID_LEN, and MSID that identify the MS are not necessary, as shown in the list under the Designated Mode column in Table 3. The resulting decrease in the number of fields added by the LAC layer reduces transmission errors.

MSG_TYPE provides transmission characteristics of the message. ACK_SEQ is the sequence number of the response. The BS confirms message receipt by checking the stored sequence of its transmitted message and the sequence of a received message. MSG_SEQ indicates the sequence of a transmitted message. ACK_REQ is a command requesting a response for the current message. If this field is set to 1, the BS

or the MS that receives the message should transmit a response message. VALID_ACK indicates the validity of an acknowledgment and ACK_TYPE indicates termination of the acknowledgment.

As noted from Table 3, designation of a reverse common channel increases a transmission success rate and reduces inter-channel interference. Furthermore, the length of an MS-initiated message is decreased, thereby reducing message transmission errors.

FIG. 4 illustrates a procedure of processing a message including reverse common channel designation request information from the BS and transmitting a response message for the received message to the BS in the MS.

Referring to FIG. 4, the MS receives a message from the BS on the forward common channel in step 401.

The L2 of the MS recognizes that the received message has a reverse common channel designation request field and places a designated mode indicator requesting transmission of the response message on the designated reverse common channel in a OCSB (PDU Control Status Block) along with an L3 SDU free of the LAC layer-related fields of the received message to the L3 in step 402.

The L3 transmits the L3 SDU and the MCSB including information requesting transmission of the response message on the designated reverse common channel to the L2 in step 403.

The L2 recognizes that the current received message is to be transmitted on the designated reverse common channel from an analysis of the MCSB received with the L3 SDU, does not add MS ID-related fields as shown in Table 3, and transmits an L2 PDU and PCSB to the MAC layer of the MS in step 404. Here, the MS ID-related fields are excluded in the L2 PDU and a designated mode indicator is placed in the PCSB.

The MAC layer transmits a signal requesting the current transmission message to be spread with a unique long code to the PHY in step 405.

The PHY spreads the reverse common channel using an ESN mask, a private long code mask, or a designated long code mask and transmits a response message or user traffic data on the designated reverse common channel in step 406. Here, the MS refers to a common power control channel in transmitting the message to the BS. The ID of the common power control channel can be detected from DAM_ADDRESS and the transmission rate of the reverse common channel is set according to RATE_WORD in the message received from the BS. If the message received from the BS designates an action time, the MS transmits the response message or the user traffic data to the BS at the designated action time. On the other hand, if the system sets the action time of the CE to a particular value, the MS does not know the action time and thus transmits the message at an arbitrary time.

Therefore, a reverse common channel signal is spread with an MS unique long code or a particular spreading code designated by the BS prior to transmission. Consequently, the designated reverse common channel serves similarly as a dedicated channel.

Second, Designation of a common channel in the MS and BS will now be described according to a second embodiment of the present invention.

FIG. 5 illustrates a BS transmission procedure for designation of a common channel according to the second embodiment of the present invention.

The L3 generates an L3 SDU and transmits the L3 SDU and an MCSB indicating that the generated message can request designation of a common channel to the L2 in step 500.

The L2 determines whether the received L3 SDU request designation of a common channel by processing the MCSB, generates an L2 PDU by adding L2-generated fields to the L3 SDU, and transmits the L2 SDU and a PCSB indicating that the message requests common channel designation to the MAC layer in step 501. Here, the L2 sets the field ACK_REQ of the message to 1 to indicate this message requires a response from the MS.

If the MAC layer finds out that the current message is a common channel designation request message by interpreting the PCSB, it transmits Designated_mode. Request command to the RC to reserve a CE of the PHY in step 502.

The RC transmits CE_Reserve.Request with action time to the PHY in step 503. The action time can be promised between the BS and the MS or set by the BS and then notified of to the MS through a message. A long code mask type is also transmitted to the MS for use in common channel designation.

The PHY transmits information about the reserved state of the CE to the RC in step 504.

The RC notifies the MAC layer whether the CE of the PHY has been successfully reserved and of a long code mask to be used during common channel designation in the MS in step 505.

After the MAC layer confirms that the CE has been successfully reserved, it constructs fields necessary for common channel designation, DESIGNATED_MODE, DAM_ADDRESS, and RATE_WORD and adds them to the L2 PDU in step 506.

In step 507, the BS transmits the message including the common channel designation information to the MS on the F-CCCH.

FIG. 6 illustrates a BS reception procedure for common channel designation.

Referring to FIG. 6, the BS receives a response message for its transmitted message on a designated R-CCCH in step 601.

The MAC layer confirms that the current received message has been received on the designated common channel, constructs an L2 PDU and a PCSB, and transmits them to the L2 in step 602. Also in step 602, the MAC layer transmits Designated_Mode_Release. Request to the RC, requesting release of the common channel from a designated mode.

The RC transmits CE_Release. Request to the PHY, requesting release of the CE from the reserved state, thereby releasing all the resources designated for designation of the common channel, in step 605.

FIG. 7 illustrates a reverse common channel processing procedure for common channel designation in the MS.

The MAC layer of the MS receives a message from the BS and determines whether the received message is a common channel designation request message in step 700.

After the MAC layer confirms that the received message is a common channel designation request message, it requests the PHY that it is changed to a long code mask to be used for common channel designation in step 701. Also, the MAC layer transmits an L2 PDU and a PCSB including common channel designation request information to the L2.

The L2 analyses the PCSB and transmits an L3 SDU and an MCSB with common channel designation indicating information to the L3 in step 702.

The L3 transmits the L3 SDU and the MCSB to the L2 in step 703.

The L2 transmits the L2 PDU and the PCSB to the MAC layer in step 704.

The MAC layer constructs a message converted from the L2 PDU and transmits the message to the PHY in step 705.

The PHY spreads the received message using the designated long code mask and transmits the spread message on the R-CCCH in steps 706 and 707. Here, the MS starts the message transmission at an action time promised with the BS and controls the transmission power of the message using a common power control channel designated by the BS.

[EFFECTS OF THE INVENTION]

As described above, in accordance with the present invention, for designation of a reverse common channel, a BS transmits a control message including long code information indicating a spreading code, channel transmission rate, and information about a common power control channel to an MS. The MS spreads user data with a unique long code for the reverse common channel and transmits a response message for the control message on the designated reverse common channel. The designation of the reverse common channel to be dedicated ensures a rapid response time, increases a transmission success rate, and reduces interference between channels caused by message retransmission. Furthermore, an MS LAC layer adds a lesser number of fields, resulting in the decrease of transmission errors.

[PATENT CLAIMS]

1. A method for designating a reverse common channel to be dedicated in a base station of a CDMA (Code Division Multiple Access) communication system, the method comprising the steps of:

transmitting, through a forward common channel, dedication information for designating the reverse common channel generated from a MAC (Medium Access Control) layer as a dedicated channel, so as to dedicate the reverse common channel for one-to-one communication between the base station and a particular mobile station, and designating the reverse common channel as a dedicated common channel;

receiving through the designated reverse common channel a response message transmitted from the mobile station; and

after receiving the response message, releasing the designated reverse common channel.

2. A method for designating a reverse common channel to be dedicated in a base station of a CDMA (Code Division Multiple Access) communication system, the method comprising the steps of:

ordering, in a MAC (Medium Access Control) layer, reservation of a channel element upon receipt of information ordering designation of the reverse common channel from a signaling layer;

upon reservation of the channel element, generating, in the MAC layer, dedication information for designating the reverse common channel as a dedicated channel, and ordering the generated dedication information to be transmitted through a forward common channel; and

receiving a response message transmitted from a mobile station through the

designated reverse common channel.

3. A method for designating a reverse common channel to be dedicated in a base station of a CDMA (Code Division Multiple Access) communication system, the method comprising the steps of:

designating in a MAC (Medium Access Control) layer a reverse common channel as a dedicated channel when a response message transmitted from a mobile station is received through the reverse common channel; and

releasing, in the MAC layer, occupation of a channel element when the response message is not received through the designated reverse common channel within predetermined time.

4. A method for designating a reverse common channel to be dedicated in a mobile station of a CDMA (Code Division Multiple Access) communication system, the method comprising the steps of:

when a message is received through a forward common channel, recognizing, in a MAC (Medium Access Control) layer, dedication information for a common channel included in a received message; and

designating, in the MAC layer, the reverse common channel as a dedicated channel according to the dedication information and generating a response message responsive to the received message within predetermined action time to transmit the response message through the designated reverse common channel.

[ABSTRACT OF THE DISCLOSURE]

[ABSTRACT]

A method of designating a channel to be dedicated between a base station and a mobile station in a CDMA communication system is disclosed. The base station generates designation information including a common channel designation indicator, the address of a common power control channel, transmission rate, and action time and transmits a message with the designation information to the mobile station. Then, the mobile station receives the message with the designation information and transmits a response message for the received message to the base station on a designated channel indicated by the designated channel indicator with transmission power set by the common power control channel at the data rate at the action time.

[REPRESENTATIVE FIGURE]

FIG. 1

[INDEX]

DESIGNATION, REVERSE COMMON CHANNEL, LAC LAYER, MAC LAYER